BEFORE THE

ORIGINAL ORIGINAL FILE

Federal Communications Commission

WASHINGTON, D.C. 20554

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MAY - 4 1992

Federal Communications Commission
Office of the Secretary

In the Matter of	)	
	)	
Amendment of Section 73.606(b)	)	MM Docket No. 92-47
Table of Allotments	)	RM-7929
Television Broadcast Stations	)	
(Bellingham and Anacortes, Washington	)	

TO: Chief, Allocations Branch

COMMENTS OF DARLENE C. PAGLINAWAN McHENRY

Darlene C. Paglinawan McHenry ("McHenry"), permittee of Low Power Television Station K24CX, Channel 24, Anacortes, Washington, by her attorneys, hereby submits her comments in response to the Notice of Proposed Rule Making, released March 13, 1992, in the above-captioned proceeding.

1. McHenry is the permittee of Low Power Television Station K24CX, Channel 24, Anacortes, Washington and is preparing to commence operations subject to Commission approval of her pending modification to increase power for Station K24CX.

2. Prism Broadcasting Company, Inc. ("Prism" or "Petitioner"), permittee of television station KBCB(TV), Channel 64, Bellingham, Washington, has requested the reallotment of UHF Channel 24 from Anacortes to Bellingham and the substitution of Channel 64 for Channel 24 at Anacortes. Station KBCB(TV) is authorized to operate on Channel 64 with effective radiated power

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List A B C D E

of 42.7 kilowatts ("kw"). Its construction permit was first granted on August 19, 1986 and now expires May 19, 1992. (File No. BPCT-911104KF).

3. Traditionally, it has been the Commission's policy to refuse to permit permittees or licensees to move from a higher to a lower UHF channel because the interested party desires to operate in the lower portion of the UHF band. Television Channel Assignments (Seattle and Tacoma, Washington), 52 RR2d 211 (1982). Where a public interest showing has been made justifying the change, a lower UHF channel assignment has been approved. Prism's showing, however, falls far short of demonstrating why the Commission should deviate from this established policy and authorize the requested allotment.

4. Prism makes a number of "bare bones" allegations in support of its request. First, it claims that Canadian officials have indicated that they will not accept Channel 64 operating from its current site at more than 1,000 kw effective radiated power ("ERP") in the direction of Canada. However, Prism provides no factual support for this bald statement. Instead, the Engineering Statement of Donald S. Wilson attached to Prism's petition merely states that the Canadian government is "unlikely" to approve operation at greater than 1,000 kw ERP without limiting ERP toward Vancouver, British Columbia, to less than 1,000 kw ERP. In short, Prism has not supported its reallotment request with any facts

concerning Canada's alleged non-concurrence, only supposition. This conclusory speculation does not remotely support Prism's request to move to Channel 24.

5. Likewise, Prism makes no sustainable public interest showing in support of its proposal, but simply alludes to unnamed "difficult obstacles" and a need to achieve signal strength parity with other commercial stations in an unidentified market. Petition, ¶10. These bare allegations are also devoid of any supporting facts.

6. There are, however, significant facts which militate against the proposed channel change. Importantly, Prism does not address the fact that there are other sites from which it could operate on Channel 64 without concern for Canadian power restrictions. The attached Engineering Statement of Richard L. Biby, P.E., defines one location on Stewart Mountain from which Prism could operate with full power on Channel 64 and another location, from which Prism could likely operate with maximum facilities of 5,000 kw. In light of these available sites, there is clearly no need for Prism to switch channels. Instead of pursuing an unnecessary rule making, Prism could have selected a different site.

7. Moreover, review of the history of Prism's permit discloses that it has made no attempt to maximize power at its

present site. As Mr. Biby points out, Prism could operate at its current site with power of approximately 105 kw ERP. Indeed, McHenry has proposed to operate with greater power at her LPTV station than has Prism. Short of advancing its rule making proposal, Prism could have taken steps to improve its present situation, but did not. This lack of interest in improving its facility is thus predictive of any operation on Channel 24. Mr. Biby also demonstrates that even if Prism were to operate with 5,000 kw on Channel 24 at its current site, very little coverage would be gained because of the rugged terrain which would block UHF television coverage. Additionally, any service area gain has virtually no population because it encompasses mountain tops or open water. Thus, the rulemaking exercise initiated by Prism is factually academic.

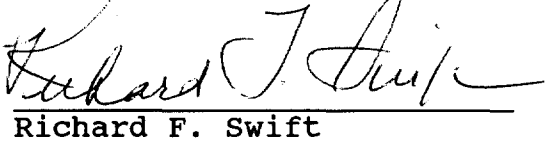
8. It is apparent from the Prism proposal that it is based, not on any factual foundation, but on sheer whimsy. However, its adoption by the Commission would result in the dislocation of McHenry's LPTV Station from Channel 24, an unnecessary hardship. McHenry has expended in excess of $50,000 in working toward putting Station K24CX on the air this summer with Asian-language programming. Because of the television "freeze" McHenry is unable to apply for a full power television station but in anticipation of that event, she has engineered her site on fifteen acres to accommodate a tower supporting a full power facility and has obtained FAA and zoning approval for the site. Substantial

promotional efforts utilizing the Channel 24 designation have already been made. Clearly, the public interest is served by initiation of this service, rather than by an unneeded change in the channel.

9. In sum, the Prism proposal should be rejected because there is no basis for it. Prism's public interest showing is facile and its technical showing superficial. There are other sites from which Station KBCB(TV) could operate on Channel 64 with maximum facilities without Canadian concerns. It has made no attempt to use those sites or to increase power at its present site. Because of terrain limitations, use of 5,000 kw provides no realistic coverage gain. Additionally, Prism's statements about unlikely Canadian concurrence are wholly conjectural. In light of its obviously baseless premise, the requested allotment should be denied.

Respectfully submitted,

Darlene C. Paglinawan McHenry

By 
Richard F. Swift
Her Attorney

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May 4, 1992

Engineering Statement in Re:
Amendment of Section 73.606(b)
Table of Allotments
Television Channels 24 and 64
Anacortes and Bellingham, Washington
MM Docket No. 92-47 RM-7929

Introduction

The Federal Communications Commission ("the FCC") has given public notice of Proposed Rule Making (MM Docket No. 92-47, RM-7929, adopted March 5, 1992, released March 13, 1992) in which it proposes to reallot vacant UHF television Channel 24, presently allotted to Anacortes, Washington, in lieu of Channel 64 at Bellingham, Washington. Channel 64 would then be allotted to Anacortes.

This engineering statement has been prepared on behalf of Darlene C. Paglinawan McHenry ("McHenry"), grantee of authority to construct K24CX, a new Low Power Television ("LPTV") station to serve Anacortes and the surrounding area on Channel 24. The FCC Notice of Proposed Rule Making is silent in regard to the effect of the proposed channel swap upon the LPTV authorization. However, at the minimum, the unfortunate result could be a lengthy delay in McHenry's plans to construct the new station.

As set forth in FCC File No. 3BMPTTL-910425I, McHenry has been authorized to construct LPTV Station K24CX, utilizing a directional antenna with a peak effective radiated power ("ERP") of 13 kiloWatts ("kW") and an effective antenna height of 744 meters. Further, McHenry has filed for authority (File Nos. 3BMPTTL-910501E and BPTTL-891208F8) to increase power to 48.1 kW, using a similar directional antenna pattern and the same effective antenna height of 744 meters.

The proponent of the proposed channel swap is Prism Broadcasting Company, Inc. ("Prism"), permittee of authority to construct television station KBCB(TV) to serve Bellingham on Channel 64 (FCC File No. BPCT-911104KF). According to the terms of BPCT-911104KF, the new station would use a directional transmitting antenna with a peak effective radiated power ("ERP") of 42.7 kiloWatts ("kW") and an effective antenna height of 676 meters.

Prism's Petition for Rule Making, filed with the FCC on September 10, 1991, requests that Section 73.606(b) of the FCC Rules be changed as follows:

	Channel No.	
Community	Delete	Add
Bellingham, WA	64	24
Anacortes, WA	24	64

Prism Petition for Rulemaking is Based on Unsubstantiated Assertion

Prism states (at Paragraph 4 of "Petition"):

> "Canadian officials have indicated that they will not accept Channel 64 operating from its current site specified on its construction permit at more than 1,000 kiloWatts ERP in the direction of Canada. Conversely, Channel 63 is limited by international treaty to 1,000 kiloWatts ERP at 305 meters AHAAT (sic) in the direction of the United States."

This statement is apparently based upon an unsupported assertion found in "Engineering Statement of Donald S. Wilson", which is associated with Prism's Petition (at third full paragraph, Page 1):

> "Table 1: KBCB Channel 64 Search herein presents a distance separation study for Channel 64 at Bellingham, when location is assumed to be at KBCB's existing transmitter site. Note that from its existing site, KBCB is short spaced by 19.4 kilometers with an allotment on channel 63 at Vancouver, British Columbia, Canada. Because of this short spacing, the Canadian government is unlikely to approve operation at greater than 1,000 kiloWatts ERP without limiting ERP toward Vancouver, British Columbia, to less than 1,000 kiloWatts ERP. The allotment on channel 63 at Vancouver, British Columbia, is limited to 1,000 kiloWatts at 305 meters toward the United States."

Absolutely no evidence is provided by Prism to indicate that there was an attempt made to coordinate a proposal for more than 1,000 kW/305 meters with the Canadian Government. It is stated on expert knowledge that the Canadian counterpart of the Federal Communications Commission has, over a period of many years, been quite willing to consider any reasonable proposal put forth by the United States. Therefore, it appears that Prism's statement to the effect that the Canadian government would not agree to operation of Channel 64 at Bellingham, WA at powers in excess of 1,000 kW/305 meters, is no more than an assertion, with no foundation in fact.

Prism's Petition Does Not Address Possibility of Fully Spaced Sites

Prism's Petition is based on the distance separation between the transmitter site as authorized for Channel 64 in BPCT-911104KF (North Latitude 48-40-48, West Longitude 122-50-23) and the reference point for the Channel 63 allotment in Vancouver, British Columbia (North Latitude 49-16-00, West Longitude 123-07-00).

A brief search of known tower locations in the vicinity disclosed that there is an existing site, overlooking Bellingham, at North Latitude 48-42-21, West Longitude 122-23-36 which is 81.8

km. distant from the Channel 63 allotment reference point at Vancouver. The United States standard for distance separation between full facility (5,000 kW/600 meters HAAT, or equivalent) UHF TV stations operating on first adjacent channels is 87.7 km. or 5.9 km more than the actual distance between these two points.

Because the Vancouver allocation is limited to 1,000 kW/305 meters HAAT, there is an excellent possibility that the Canadian Government would approve a maximum facility operation at this particular site. Federal Aviation Administration ("FAA") files indicate that there is a 160 foot high tower at the site (FAA File No. 99FC0000), which is clear evidence that this location is already developed for electronics installations.

There is also a location on a mountain located to the east of Bellingham (locally known as Stewart Mountain, though not named on available U.S. Geological Survey maps), that meets all pertinent distance separation requirements, even based on the assumption of maximum facility (5,000 kW/600 meters HAAT) stations. This alternative Channel 64 site is located (according to available maps) near both a road and a more than adequate source of electrical power, at North Latitude 48-43-02, West Longitude 122-15-02. The elevation at this illustrative location is 3087 feet (941 meters).

As is illustrated by Tabulation 1 ("Constraints Study TV Channel 64"), attached hereto, it is indeed possible for Prism to identify fully-spaced transmitter sites (e.g., Stewart Mountain) for its proposed Channel 64 station. Thus, there is no need whatsoever for Prism to seek relief from the terms of the existing international television broadcast agreement between the United States and Canada. A solution to Prism's alleged power problem is readily available through the simple expedient of the proper selection of transmitter location.

Prism Has Not Proposed Maximum Power/Height at Authorized Site

According to the terms of BPCT-911104KF, KBCB is authorized to operate with a peak effective radiated power of 42.7 kW, using a directional antenna whose radiation center is to be 676 meters above average terrain. Even if Prism's unsubstantiated assertion that the maximum permissible power for KBCB were to be 1,000 kW/ 306 meters, because of proximity of the Canadian Border, there has been no application by Prism for authority to operate at the equivalent power for its authorized antenna height, which is approximately 105 kW ERP.

Use of a Directional Antenna At Bellingham Makes Economic Sense

Prism has received authority to construct a television broadcast station to serve population and area in the United States, not Canada. A directional transmitting antenna offers Prism an opportunity to concentrate KBCB signals in areas where population exists within the United States. Doing so could reduce the required transmitter power (and thereby, transmitter

capitalization and operating expenses) by approximately fifty (50) percent.

Coverage is Limited by Terrain and Distance to Population

An extensive study of the signal coverage that is possible from the proposed Bellingham Channel 24 reference point reveals that extremely little coverage could be gained through a power increase from 1,000 kW to 5,000 kW, or the power/height equivalence. (It is noted that the proposed reference point for Channel 24 at Bellingham provides more than 600 meters effective antenna height.) Factors that act to greatly decrease the effectiveness of a power increase include the rugged terrain that exists just inland (eastward) of the United States coast line, and the distance to concentrations of population (such as Tacoma/Seattle) that are outside the reach of Channel 24 at Bellingham, regardless of power level.

Attached hereto as Map Figure 1, "Comparative Illustration of 64 dBu Coverage/5,000 kW and 1,000 kW ERP at Mt. Constitution." Figure 1, is based on the widely-recognized ITS Rough Terrain Model (also known as "the Longley-Rice Model") as adjusted for the effects of vegetation and urbanization upon signal strength.

Figure 1 was generated by a computer program, developed by this firm, Communications Engineering Services, P.C., in cooperation with Communications Data Services, Inc. of Falls Church, Virginia. Attachment 1, "Propagation Predictions," attached hereto, discusses the methodology upon which Figure 1 is based.

It is noted that the almost all of the (very limited) increase in coverage that would result in operating a UHF TV station at the proposed Channel 64 transmitter location is on mountain tops or on open water. Essentially none of the "gain" area has identifiable population.

Map Figure 2, is an "Illustration of Grade B, Grade A, and City Grade Service Contours/With an ERP Equivalent of 1,000 kW, Predicted in Accordance with FCC Rules." Figure 2 clearly illustrates that a 1,000 kW UHF facility at Bellingham can provide commercially viable signals to all areas that could reasonably be covered with even 5,000 kW.

Summary Statement

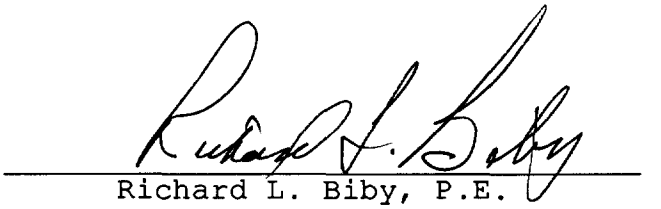
Prism has based its petition for swapping Channel 64 at Bellingham, Washington, with Channel 24 (Anacortes) on an unsubstantiated assertion that Canadian authorities have refused to agree to more than the equivalent of 1,000 kW/305 meters HAAT for Channel 64 when operated at the site specified by Prism. No evidence has been offered to prove that coordination of higher power has even been requested by Prism.

Prism offers no evidence that it has even considered non-short spaced transmitter sites, even though, as illustrated in the instant statement, such sites do exist.

Prism appears to be stating that there is something inherently distasteful about directional transmitting antennas. In fact, the use of a directional transmitting antenna, particularly at the transmitter location specified by Prism, would act to conserve precious electrical power and capital, while concentrating Channel 64's signals in the areas where American population exists.

Finally, Prism has offered no evidence that more than 1,000 kW/305 meters HAAT is necessary, or even rational, given the natural limitations in the form of rugged terrain and distance to concentrations of population, that exist. These factors dictate the maximum coverage that is possible from Prism's specified transmitter location.

In sum, Prism's assertions are specious and cannot properly serve as the basis for a Commission decision to order the requested channel allotments.



Richard L. Biby, P.E.
District of Columbia Reg. No. 5701E
Commonwealth of Virginia Reg. No. 14018
May 4, 1992

Tabulation 1
Constraints Study TV Channel 64

Title:
Reference City: Bellingham
Translators Are Not Included

Latitude: 48-43-02
Longitude: 122-15-02
FCC Database: 920323

Call / Auth / Owner	City of License, St / FCC File No.	Chan / Zone / Docket No.	ERP (kW)	AMSL-m / HAAT-m	Latitude / Longitude	Br-to / -from	Dist (km)	Req. (km)
ALLOC	OSOYOOS, BC	49 -			49-02-00	79.2	207.2	119.9
		II			119-28-00	261.3	87.3	CLEAR
ALLOC	COURTENAY, BC	49 o			49-41-00	299.3	227.4	119.9
		II			125-00-00	117.2	107.5	CLEAR
ALLOC	ASHCROFT, BC	49 +			50-43-00	17.0	233.1	119.9
		II			121-17-00	197.7	113.2	CLEAR
ALLOC	NANAIMO, BC	50 o			49-10-00	292.8	133.0	95.7
		II			123-56-00	111.5	37.3	CLEAR
NEW	TACOMA, WA	56 o	5000	678	47-32-53	197.8	136.4	31.4
APP	BPET-870116KJ	II		571	122-48-22	17.4	105.0	CLEAR
KOREAN-AMERICAN MISSIONS, INC.								
ALLOC	NANAIMO, BC	60 o			49-10-00	292.8	133.0	31.4
		II			123-56-00	111.5	101.6	CLEAR
ALLOC	SEATTLE, WA	62 o			47-36-32	183.0	123.4	31.4
		II			122-20-12	2.9	92.0	CLEAR
		D82-8						
ALLOC	VANCOUVER, BC	63 o			49-16-00	314.4	88.0	87.7
		II			123-07-00	133.7	0.3	CLOSE
LIMIT TO 1 MEGAWATT,305 M EHAAT OR THE EQIV IN THE DIR. OF CH								
ALLOC	ANACORTES, WA	64 o			48-30-06	227.9	35.8	248.6
ADD		II			122-36-37	47.7	-212.8	SHORT
PRISM BROADCASTING CO., INC.								
REL. TO RM IN BELLINGHAM, WA								

Tabulation 1
Constraints Study TV Channel 64 Continued

Title:
Reference City: Bellingham
Translators Are Not Included

Latitude: 48-43-02
Longitude: 122-15-02
FCC Database: 920323

Call / Auth / Owner	City of License, St / FCC File No. / Docket No.	Chan / Zone	ERP (kW)	AMSL-m / HAAT-m	Latitude / Longitude	Br-to / -from	Dist (km)	Req. (km)
ALLOC	BELLINGHAM, WA	64 o			48-40-48	264.8	43.6	248.6
DEL		II			122-50-23	84.3	-205.0	SHORT
PRISM BROADCASTING CO., INC.								
REL. TO RM IN ANACORTES, WA								
KBCB	BELLINGHAM, WA	64 o	42.7	712	48-40-48	264.8	43.6	248.6
CP	BPCT-911104KF	II	DA	676	122-50-23	84.3	-205.0	SHORT
PRISM BROADCASTING CORPORATION								
DA: Jampro ODD911104KF @ 0.0 deg								
ALLOC	VICTORIA, BC	66 o			48-25-00	248.3	88.9	31.4
		II			123-22-00	67.4	57.5	CLEAR
ALLOC	VANCOUVER, BC	68 o			49-21-12	324.3	87.5	31.4
		II			122-57-18	143.8	56.1	CLEAR
APPROVED SITE: 49-21-12 N.L.,122-57-18 W.L.								
ALLOC	NANAIMO, BC	69 o			49-10-00	292.8	133.0	31.4
		II			123-56-00	111.5	101.6	CLEAR

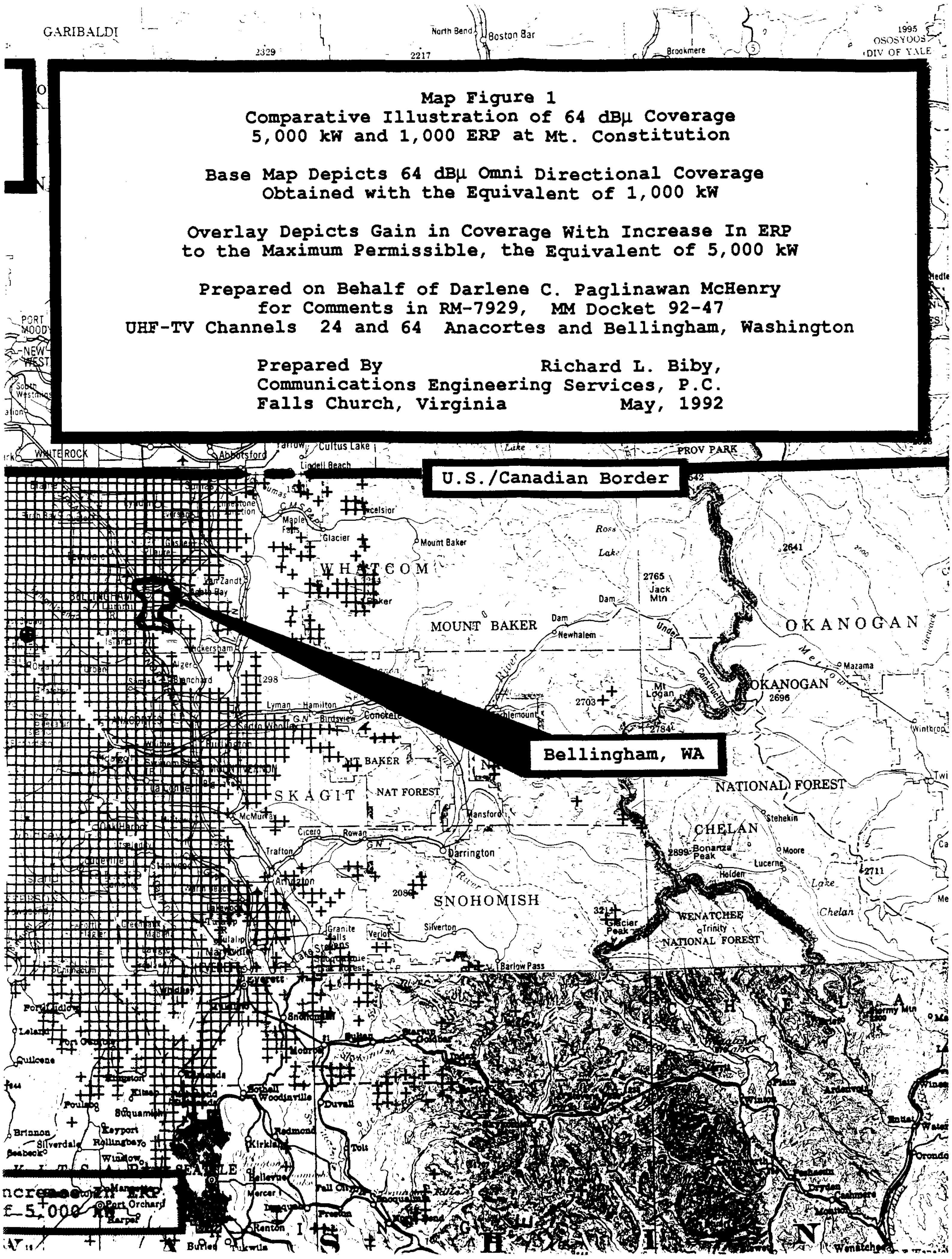
Map Figure 1
Comparative Illustration of 64 dBμ Coverage
5,000 kW and 1,000 ERP at Mt. Constitution

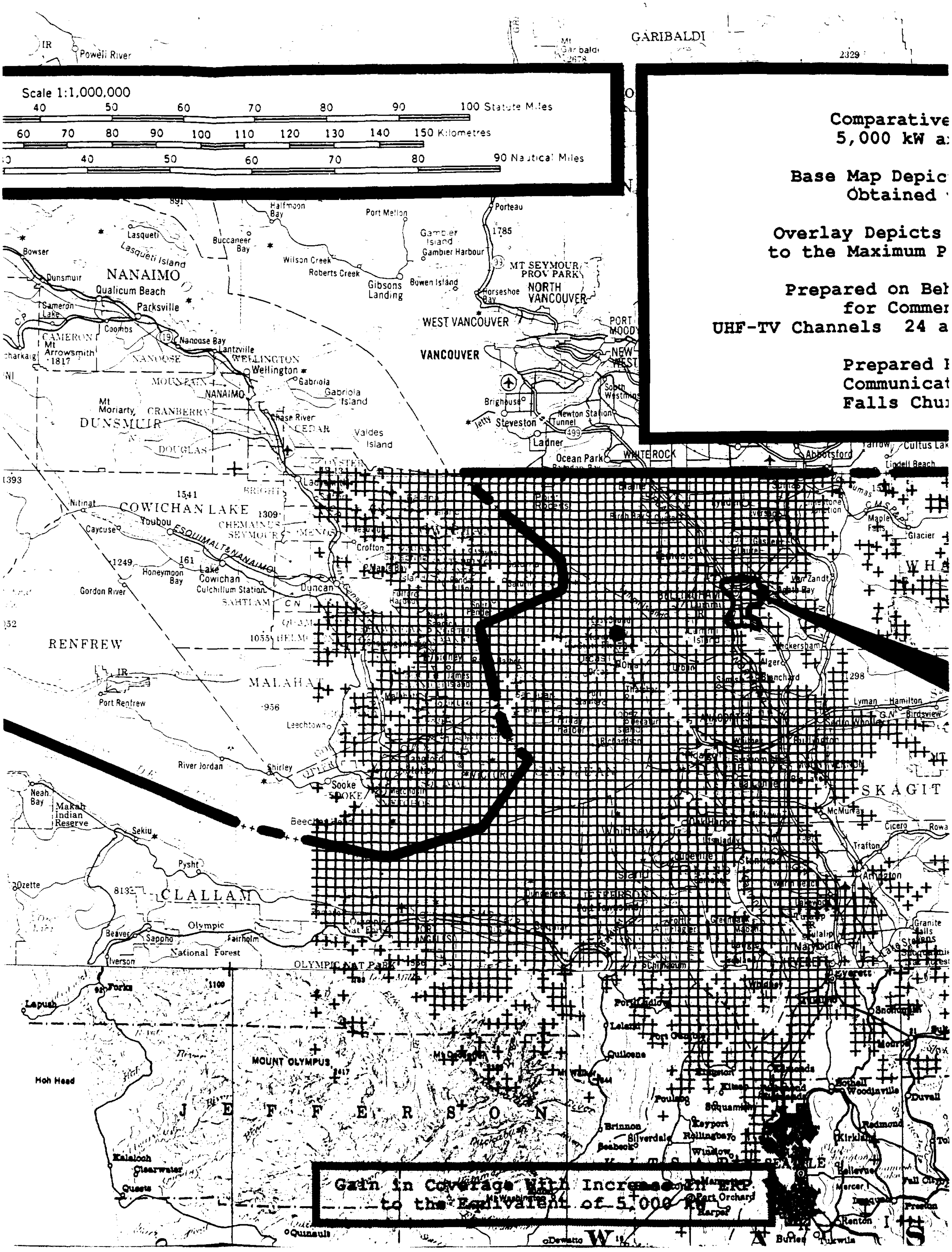
Base Map Depicts 64 dBμ Omni Directional Coverage
Obtained with the Equivalent of 1,000 kW

Overlay Depicts Gain in Coverage With Increase In ERP
to the Maximum Permissible, the Equivalent of 5,000 kW

Prepared on Behalf of Darlene C. Paglinawan McHenry
for Comments in RM-7929, MM Docket 92-47
UHF-TV Channels 24 and 64 Anacortes and Bellingham, Washington

Prepared By Richard L. Biby,
Communications Engineering Services, P.C.
Falls Church, Virginia May, 1992

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100 Statute Miles
150 Kilometres
90 Nautical Miles
Gain in Coverage With Increase in ERP
to the Equivalent of 5,000 kW
GARIBALDI
Powell River
NANAIMO
Qualicum Beach
Parksville
WEST VANCOUVER
VANCOUVER
NORTH VANCOUVER
Gibsons Landing
Bowen Island
MT SEYMOUR PROV PARK
Nanaimo
Gabriola Island
Brighouse
Steveston
Ladner
Ocean Park
WHITE ROCK
Abbotsford
DUNSMUIR
COWICHAN LAKE
Lake Cowichan
Duncan
Crofton
RENFREW
MALAHAT
Port Renfrew
River Jordan
Shirley
Sooke
Neah Bay
Makah Indian Reserve
Sekiu
Pysht
CLALLAM
Olympic
National Forest
OLYMPIC NAT PARK
Forks
Lapush
MOUNT OLYMPUS
Hoh Head
J E F F E R S O N
Kalaloch
Clearwater
Queets
Quinault
SKAGIT
Lyman
Hamilton
McMurray
Arlington
Granite Falls
Everett
Snohomish
Monroe
Bothell
Woodinville
Redmond
Kirkland
Bellevue
Mercer I
Renton
Tukwila
Burien
SEATTLE
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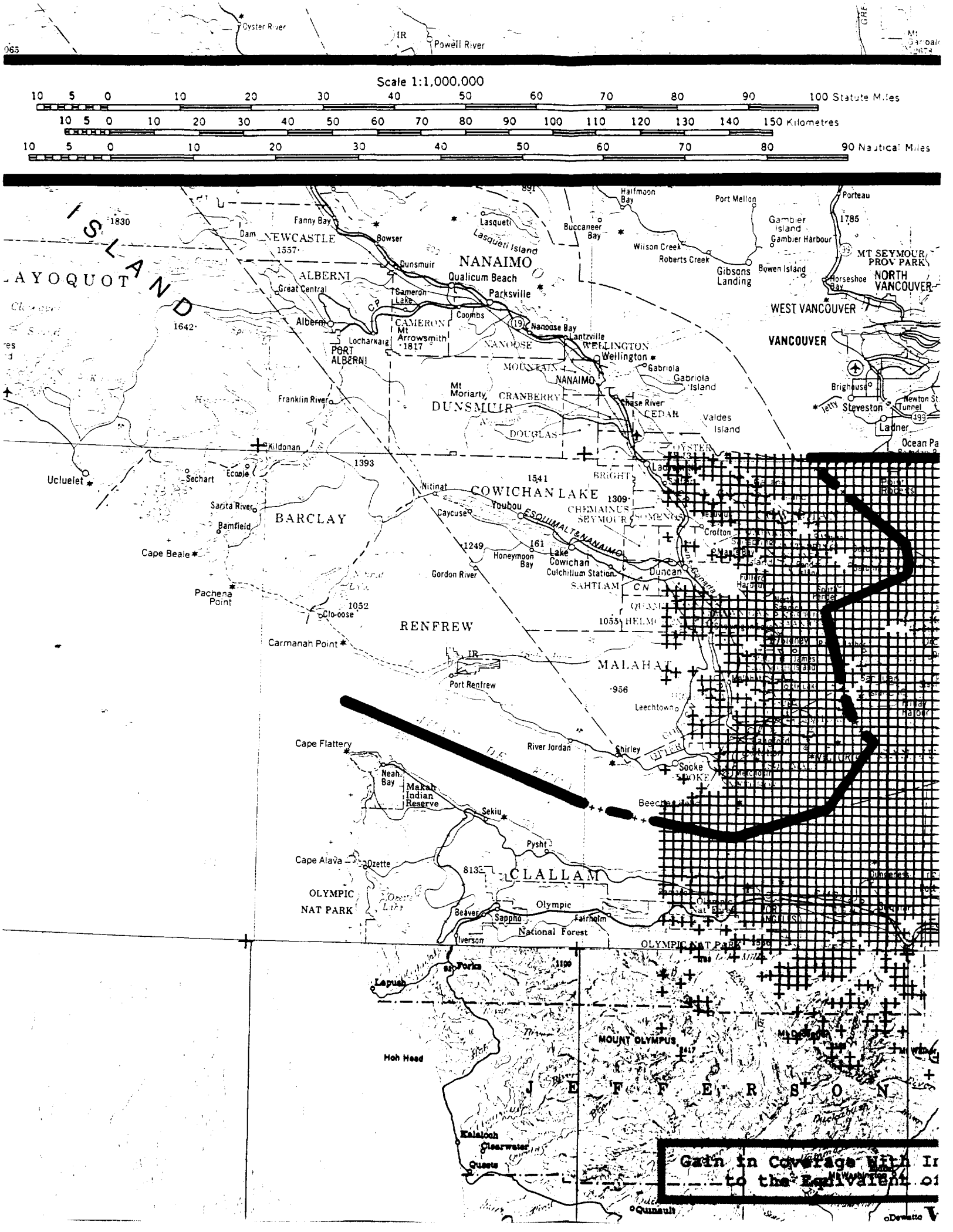
Keyport
Brinnon
Seabeck
Quilcene
Port Ludlow
Leland
Kingston
Winslow


Oyster River
IR
Powell River
Scale 1:1,000,000
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10 5 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 Kilometres
10 5 0 10 20 30 40 50 60 70 80 90 Nautical Miles
ISLAND
AYOQUOT
1830
Fanny Bay
Dam
NEWCASTLE
1557
Bowser
Lasqueti
Lasqueti Island
Buccaneer Bay
Halfmoon Bay
Port Mellon
Porteau
Gambier Island
1785
Gambier Harbour
Wilson Creek
Roberts Creek
Gibsons Landing
Bowen Island
MT SEYMOUR PROV PARK
NORTH VANCOUVER
Horseshoe Bay
WEST VANCOUVER
VANCOUVER
Dunsmuir
NANAIMO
Qualicum Beach
Parksville
ALBERNI
Great Central
Sameron Lake
Coombs
Alberni
1642
CAMERON
Mt Arrowsmith
1817
Nanoose Bay
Lantzville
WELLINGTON
Wellington
Locharnaig
PORT ALBERNI
NANOOSE
MOUNTAIN
NANAIMO
Gabriola
Gabriola Island
Brighouse
Jetty
Steveston
Newton St
Tunnel
Ladner
Ocean Pa
Mt Moriarty
CRANBERRY
DUNSMUIR
Franklin River
Chase River
CEDAR
Valdes Island
DOUGLAS
Kildonan
1393
Ucluelet
Sechart
Ecoole
1541
COWICHAN LAKE
1309
CHEMAINUS
SEYMOUR
Nitinat
Youbou
Caycuse
ESQUIMALT & NANAIMO
Crofton
Sarita River
BARCLAY
Bamfield
Cape Beale
1249
161
Honeymoon Bay
Lake Cowichan
Gordon River
Duncan
Cultchilum Station
SAHTLAM
CN
Pachena Point
1052
Clo-oose
RENFREW
1055
HELM
Carmanah Point
IR
Port Renfrew
MALAHAT
956
Leechtown
Cape Flattery
River Jordan
Shirley
Sooke
Neah Bay
Makah Indian Reserve
Sekiu
Pysht
Cape Alava
Ozette
813
CLALLAM
OLYMPIC NAT PARK
Olympic
Beaver
Sappho
Fairholm
National Forest
Iverson
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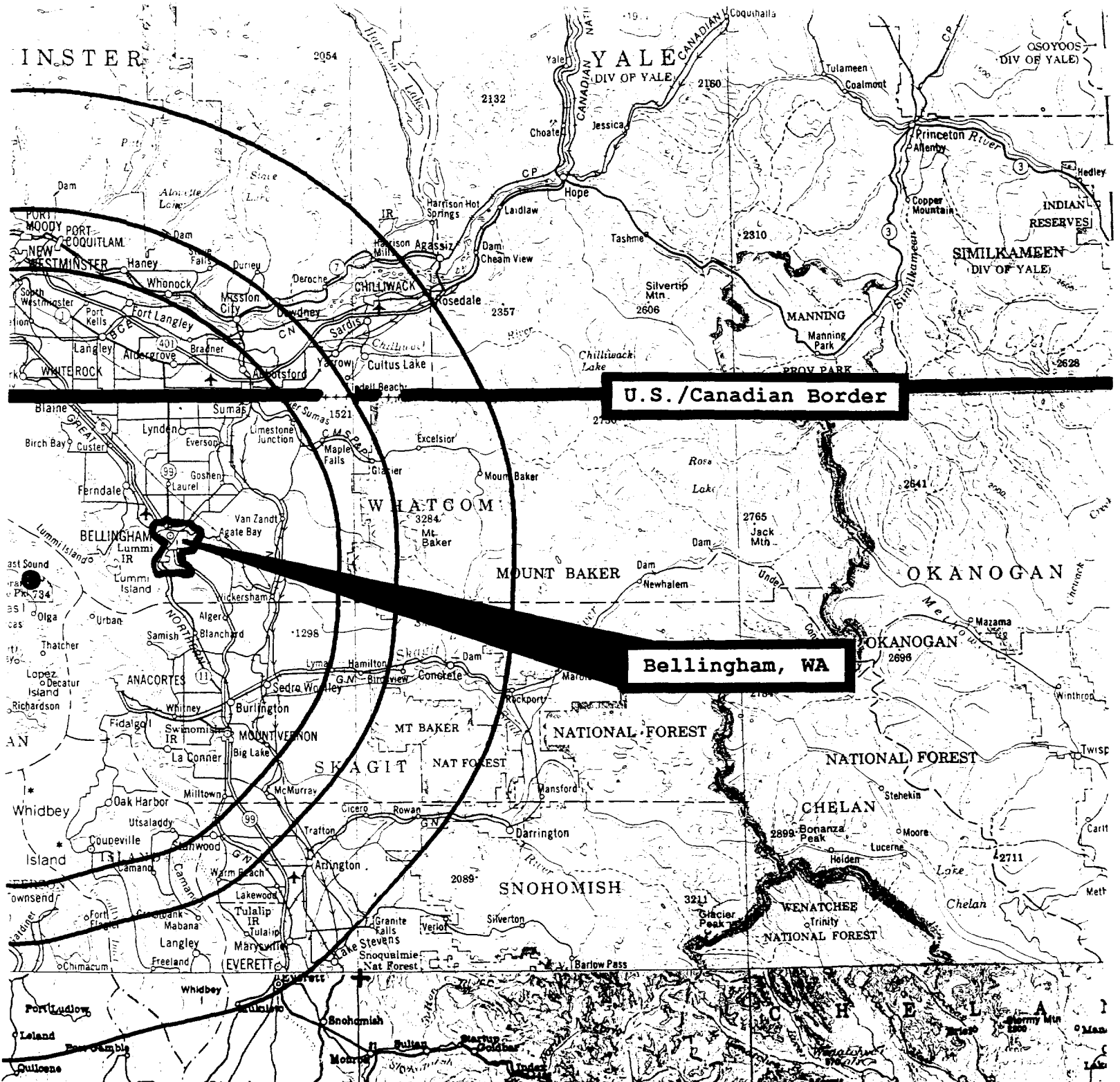

Map Figure 2
Illustration of Grade B, Grade A, and City Grade Service Contours With an ERP Equivalent to 1,000 kW, Predicted in Accordance with FCC Rules

Prepared on Behalf of Darlene C. Paglinawan McHenry for Comments in RM-7929, MM Docket 92-47 UHF-TV Channels 24 and 64 Anacortes and Bellingham, Washington

Prepared By Richard L. Biby,
Communications Engineering Services, P.C.
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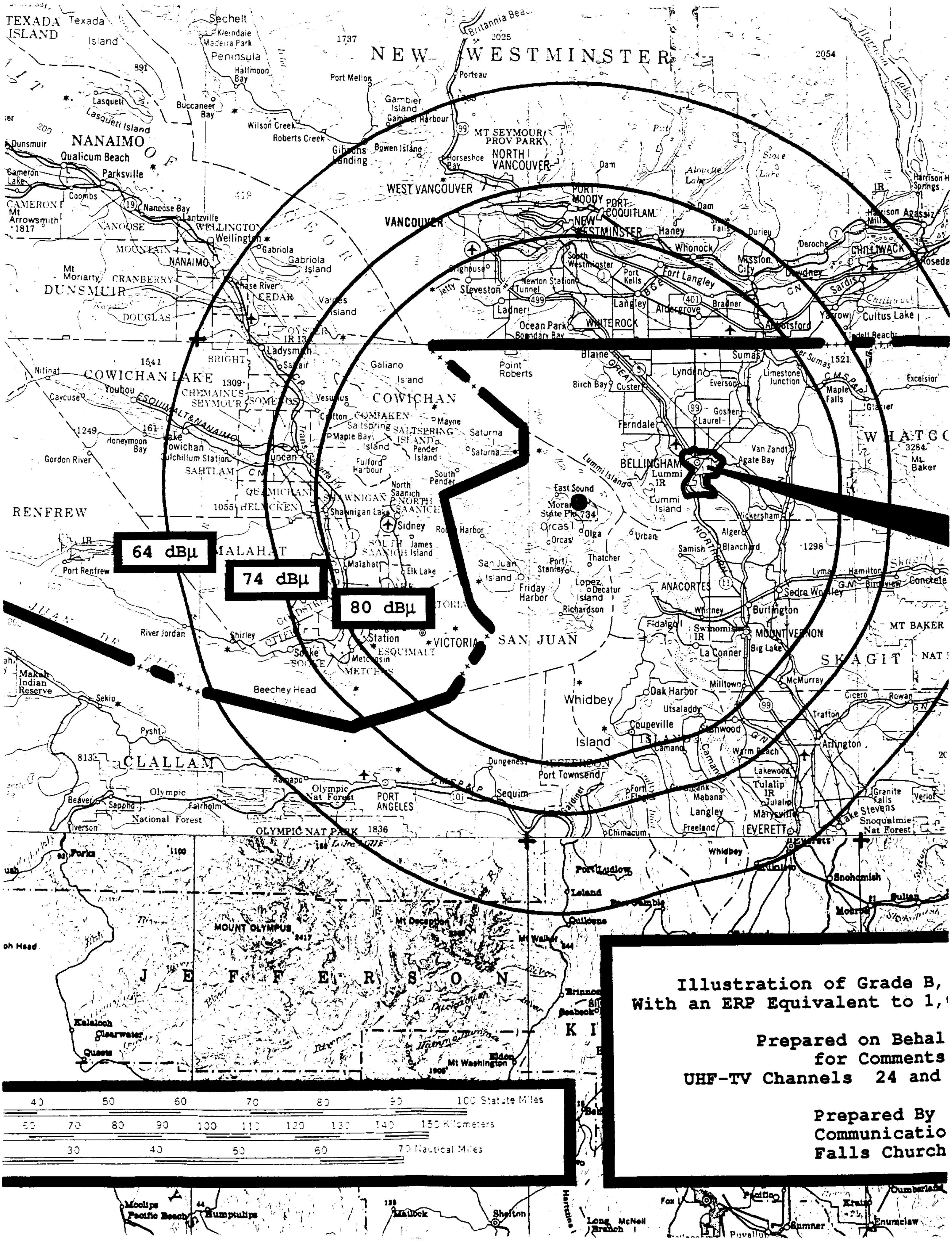

Illustration of Grade B,
With an ERP Equivalent to 1,

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UHF-TV Channels 24 and

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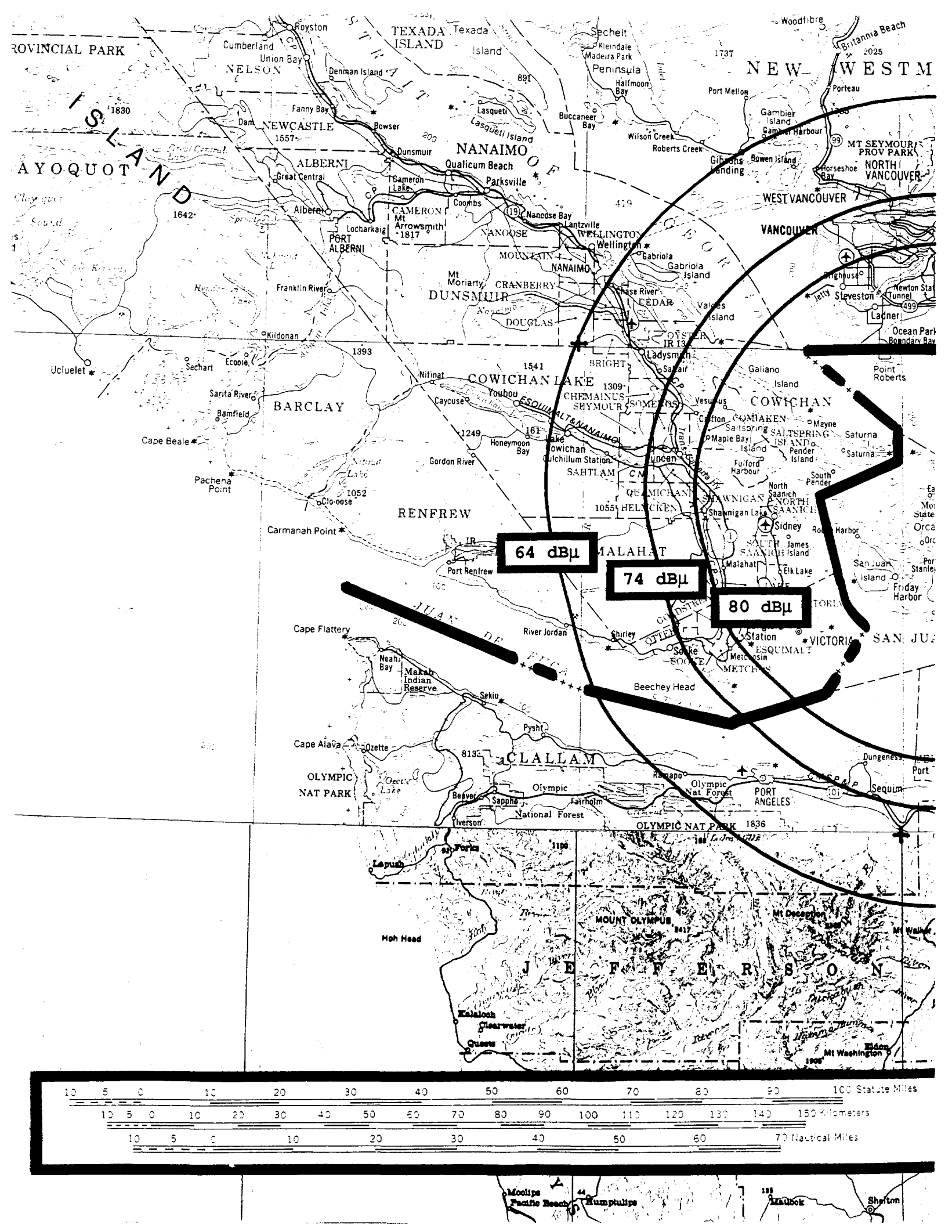
64 dBµ
74 dBµ
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10 5 0 10 20 30 40 50 60 70 80 90 100 Statute Miles
10 5 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 Kilometers
10 5 0 10 20 30 40 50 60 70 Nautical Miles

DISCUSSION OF PROPAGATION PREDICTIONS

Signal Strength Prediction Maps

Communications Data Services, Inc. (CDS) provides "real life" depictions of the signal coverage of FM, Television and Land Mobile stations. The CDS product, in the form of transparent overlays and associated standard published base maps, uses different colors to indicate the predicted signal strength in each of thousands of small areas (pixels), surrounding the transmitter site. The effect is to paint a vivid, easily understandable picture of the station's coverage.

The CDS prediction maps are based on the National Telecommunications and Information Administration (NTIA) "Longley-Rice" radiowave propagation model, corrected for the effects of surface (building) clutter and vegetation cover, used in conjunction with the most advanced terrain database now available. Predictions can be based on a wide range of map scales, from 1:24,000 (7.5 minute topographic map) to 1:1,000,000. The size of each pixel is 3 millimeters, as plotted on the map, which corresponds to a distance (on the ground) of approximately 72 meters (236 feet) on a 7.5 minute topographic map, and about 3 kilometers (1.9 miles) on a 1:1,000,000 scale map. Plots of greater (or lesser) resolution can be provided on special order.

Computer Models of Radiowave Propagation

There are a number of published computational procedures which can be used to predict the loss of radiowave signal strength between source and destination, particularly from a fixed (broadcast) station to a mobile receiver. Examples of quality efforts to characterize the enigmatic nature of terrestrial radiowave propagation include the works of Bullington, Egli, Okumura, Reudink and the U. S. Department of Commerce team of Rice, Longley, Norton and Baris. (A bibliography of these and other important publications is appended to this report.)

Each of these authors or groups of authors has classified the types of path which may be encountered by a radio signal (e.g., "line-of-sight", "diffracted" over an obstacle such as the curvature of the earth or a hill, or "scattered" by atmospheric turbulence or other mechanisms) and has provided either graphical or computational methods of estimating transmission loss.

Possibly the most complete of these efforts is the product of a team of scientists and engineers at the National Bureau of Standards. (Transmission Loss Predictions for Tropospheric Communication Circuits, NBS Tech. Note No. 101, Volumes I and II 1967). Unfortunately, many of the approaches set forth in NBS 101 are too lengthy and tedious to be particularly attractive, even with the availability of modern computers.

The Longley-Rice Computer Model

One year after the publication of NBS 101, two of its authors, Anita G. Longley and Phillip L. Rice, published a simplified version of the techniques discussed in that and other earlier papers. The "ITS Irregular Terrain Model" (commonly called "the Longley-Rice Model") has the significant advantages of being compact; of being able to operate in either an "area" mode or in a point-to-point mode; and of providing reasonably accurate answers. It is possible (though perhaps somewhat exhausting) to generate detailed maps of station coverage by using the Longley-Rice model in the point-to-point mode from a given transmitter location to a large number of receiving locations.

Practical Implementation of the Longley-Rice Model

The Longley-Rice Model, operated in the point-to-point mode, requires a source of terrain profile data for each path to be studied. It is clearly impractical to provide data derived manually from topographic quadrangle maps or a similar source for the hundreds (or thousands) of paths needed to represent a typical station's service area.

Fortunately, terrain data files in computer readable format are now available for the forty-eight contiguous United States, Alaska, Hawaii, and Puerto Rico. The particular terrain data file used by CDS in these studies, the Defense Mapping Agency (DMA) 3 Arc Second Terrain Database, contains an elevation value (to the nearest meter) every three seconds of latitude by three seconds of longitude. At a latitude of 39 degrees (roughly through Washington, DC), the distance between these terrain elevation points is about 93 meters (300 feet) in the north-south direction, and about 72 meters (235 feet) in the east-west direction. The terrain database presently being maintained by CDS contains approximately 1.4 billion individual height values.

Effects of Clutter and Vegetation Cover

Signal strength predictions made with the Longley-Rice Model, for good clear line-of-sight paths devoid of urban clutter and vegetation cover, are generally accurate enough for practical purposes. However, such paths are the rare exception, not the rule, for most broadcast and land mobile communications links.

For example, the median attenuation observed at FM Broadcast frequencies (about 100 MHz) in heavily urbanized area is typically about 16 decibels (dB) greater than predicted by Longley-Rice. What is needed, then, is a method of correlating excess path loss (and the companion multipath fading effects) to various types of land clutter/cover.

The U.S. Geological Survey provides maps, in both printed and digital formats, of land use and vegetation cover for most of the contiguous United States. The availability of such data in digital form makes it possible for a computer program to fetch a Federal Information Processing Standard ("FIPS") code number indicative of the land use/cover at a given set of geographic coordinates. Here then, is the key to correlating observed "excess" signal attenuation to the types of vegetation and/or building clutter along the propagation path.

Clutter/Cover Attenuation and Multipath Fading Factors

There being no known source of data regarding the median attenuation and multipath fading characteristics of each class of land use/cover, it became necessary to develop a method of making those determinations. Communications Engineering Services, P. C. (CES), in cooperation with CDS, has assembled a set of measurement equipment, designed to collect signal strength data, which can then be processed to obtain the desired attenuation and multipath ("fast") fading statistics characteristic of each type of land use/cover encountered.

In the CES system, a portable computer is used in conjunction with a field strength meter and a LORAN-C receiver. In operation, the computer sets the field strength receiver to the desired frequency, initiates a calibration procedure within the receiver, and then monitors the data stream from the LORAN receiver to determine the latitude/longitude. Once the location is known, the computer collects 100 individual field strength readings from the calibrated receiver. These measurements are taken at such time intervals as to represent a total distance of about ten to twenty wavelengths at the measurement frequency.

The field strength data, together with the geographic coordinates, measurement frequency, date and time, are recorded on a computer disk file. If the signal source is continually available, as is true for broadcast stations, data sets can be obtained at normal road speeds. It is possible to compile hundreds of such data sets, gathered over many road miles, in a matter of several hours.

The set of "experience" data on which the CDS prediction model is founded includes a large base of over 1,200 measurement sets made on a group of eleven Washington, DC area FM stations, over 3,000 measurement sets on eleven "low-band" (45 MHz) public safety radio sites in California; and thousands of measurements sets gathered for 450 MHz and 800 MHz public safety and Cellular systems throughout the country. Each such measurement set included at least 100 individual point signal strength measurements.

The extensive set of data collected through the means just described was processed by a computer program that predicts the received signal level (by the Longley-Rice Model) and then correlates the observed difference between predicted and observed signal strengths with the type of land use/cover surrounding each

individual measurement location. In addition, the extent of multipath fading effects ("fast fading") are determined for each type of clutter/cover encountered during the measurement program.

By these methods, median attenuation and multipath fading range, characteristic of different frequencies and different types of vegetation and urban clutter, have been developed from a large base of measured signal strength data sets. Those factors can be used in conjunction with the Longley-Rice Model to predict the received signal strength at each of a very large set of locations, in such a manner as to generate an easily understandable map-picture of a station's coverage.

A typical CDS prediction map is based on almost 30,000 individual signal paths (pixels) and uses three or more colors to depict different values of signal strength.

General Discussion of Studies Supplied

In the particular case of FM Broadcast stations, the CDS maps are based on predicted received signal power, assuming a dipole receiving antenna six feet above ground level. Studies conducted by CDS and others indicate that a signal strength such that a dipole antenna delivers -60 dBm (decibels relative to a milliwatt) to a matched load will result in good reception on a typical portable receiver ("boom box") inside a typical urban building. Stated differently, if one were to experimentally determine a location in which the signal strength was just enough to provide good (indoor) reception on a typical portable receiver, it would be found that a "proper" antenna (i.e., a dipole) at that location would deliver approximately -60 dBm to a matched load. This statement is, of course, only an attempt to arrive at a rational and quantifiable (and thereby computable) description of the signal strength necessary to provide service to a certain class of receivers as operated in a specific environment.

Similarly, it is estimated that a signal strength such that a dipole would delivery -65 dBm into a matched load will provide reception on a portable receiver outside of buildings; -70 dBm will provide good-to-adequate reception on a typical automobile receiver; and that signals much below -70 dBm will fail to provide even acceptable automobile reception.

It is recognized that these estimates of required signal strength are, perhaps, somewhat precarious. However, it is necessary that some such connection between the subjective and the calculable be made before rational estimates of FM station coverage are possible.

In the example (attached hereto), different colors have been used to indicate predicted signal strength for a (hypothetical) FM broadcast station in the San Francisco Bay area. Each small area, 2 millimeters square in the example at hand, has been drawn by the computer plotter in green if the signal strength is predicted to be

equal to or greater than the value necessary for indoor reception on a portable receiver; in blue for those areas where indoor reception on a receiver with no external antenna might be difficult but in which adequate reception could be expected out-of-doors; and in red where poor reception is expected for portable receivers, but where a typical automobile receiver will likely provide adequate reception.

In addition to signal coverage plots for a single station, CDS has employed the mylar overlay format to present coverage of multiple FM, Television or Land Mobile facilities. This comparision of coverages, given a signal strength threshold, may be performed on as many as three stations, each represented by a different pixel color.

The signal coverage of two stations may be plotted with a specified color indicating the interference between the two facilities. Similarly, a plot may be created displaying the complete coverage of one station with the resulting interference from another station.

The CDS prediction maps for one or two facilities may be supplemented with area and population information within the service area.

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CERTIFICATE OF SERVICE

I, Catherine M. Violette, a secretary in the law firm of Tierney & Swift, do hereby certify that on the 4th day of May, 1992, that a copy of the foregoing "Comments of Darlene C. Paginawan McHenry" was sent by U.S. Mail, postage prepaid to the following:

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